A BOTTOM TRAWL SURVEY FOR CRABS IN THE SOUTHERN, KAMISHAK, AND BARREN ISLANDS DISTRICTS OF THE COOK INLET MANAGEMENT AREA, 20-23 JUNE AND 17-20 AUGUST 1996

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ABSTRACT

During 20-23 June and 17-20 August 1996, the Alaska Department of Fish and Game (ADF&G) conducted bottom trawl surveys to assess red king (*Paralithodes camtschatica*), Tanner (*Chionoecetes bairdi*), and Dungeness (*Cancer magister*) crabs in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area. The 19 tows in the Southern District yielded a population estimate of nearly 2.0 million Tanner crab, representing a 38% decline from the 1995 survey estimate. The 1996 Southern District survey catch of Dungeness crab increased 92% over the 1995 catch, but overall abundance of legal males remained insufficient to support a commercial fishery. Results from 19 tows in the Kamishak and Barren Islands Districts yielded a population estimate of 5.0 million Tanner crab, representing a 15% increase over the 1995 estimate. However, the lack of new recruit crab in this population remains a concern. The 1996 survey catches of only 7 king crab in the Southern District and 40 king crab in the Kamishak and Barren Islands Districts indicate these populations remain severely depleted.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has been conducting bottom trawl surveys for red king (*Paralithodes camtschatica*) and Tanner (*Chionoecetes bairdi*) crabs in the Cook Inlet Management Area since 1990 (Figure 1; Kimker 1996*a*). Data from these surveys are used to generate crab population estimates, monitor trends in stock abundance, and set quotas for the commercial fisheries.

In 1991, trawl surveys superseded crab pot surveys as ADF&G's preferred method for king and Tanner crab assessment in Cook Inlet (Kimker 1991). Pot surveys provided an index of abundance which was viewed relative to commercial catch data. Problems in interpreting pot survey results, such as effects of soak time, the need for commercial fishery data, and the inability of generating abundance estimates, led ADF&G to develop trawl surveys as an assessment tool. Trawl surveys conducted by the National Marine Fisheries Service (NMFS) in the Bering Sea and by ADF&G in the Westward Region have provided reliable information to assess stocks and develop fisheries management strategies for king and Tanner crabs.

Many species of groundfish are incidentally captured during crab trawl surveys, but groundfish sampling was limited during the initial years of these surveys due to a lack of personnel. Beginning in 1993, an additional biologist participated in crab trawl surveys to collect groundfish data. Groundfish catch information will be documented in other reports.

The objectives of the 1996 survey were:

1. Estimate the abundance of Tanner and red king crab stocks in the Southern, Kamishak and Barren Islands Districts of the Cook Inlet Management Area.

2. Document the size and shell age of all Tanner, king and Dungeness crabs captured.

3. Determine the clutch fullness and egg condition of all female crabs captured.

METHODS

Study Area and Survey Stations

Survey area selection for trawl surveys was based on past pot and trawl survey results and commercial catch information. The two general areas surveyed included: (1) the Southern District, that portion of Kachemak Bay extending west to 152 00' W. longitude, and (2) the Kamishak and Barren Islands Districts, often referred to as Kamishak Bay and including waters of Kamishak Bay extending east to 152 40' W. longitude (Figure 1).

Initially, Southern District survey stations were 2.5 nautical mile squares (6.25 nmi^2; Figure 2) and Kamishak Bay stations were 5.0 nautical miles squares (25.0 nmi^2; Figure 3; Kimker 1991). However, individual station size and shape varied due to irregular coastline and depth contours. Depths shallower than 18 m (10 fathoms) were subsequently omitted from surveys and analyses to reduce gear damage loss and to better represent Tanner and king crab habitat. Southern District stations were further stratafied in areas deeper and shallower than 92 m (50 fathoms). Individual stations were also evaluated with respect to results of previous surveys and commercial fisheries, occasionally resulting in an increase or decrease in the size of some survey stations.

The trawl path within a station grid was selected by the vessel skipper to provide a 1.0 nautical mile with a low probability of gear loss or damage. Each tow required approximately 25 minutes of towing at a speed of 2.5 nautical miles per hour. All tows were made during daylight hours. Data analysis was restricted to tows 0.5 nautical miles in length. Data from tows shorter than 0.5 nautical miles were discarded, and these tows were repeated if time allowed.

Vessel and Gear

The state research vessel *Pandalus*, overall length 20.1 m (66 ft), was used for surveys. A 400 mesh eastern trawl with a 21.3 m (70 ft) headrope, a 29.0 m (95 ft) footrope, and 363 kg (800 lb), 1.5 m x 2.1 m, Nor'Eastern Astoria V trawl doors was used. The net opening was estimated to be 2.7 m (9 ft) high and 12.2 m (40 ft) wide. Trawl stretched mesh was 1.6 cm (4 inch) in the wings and body, 1.4 cm (3½ inch) in the intermediate and cod end, and 0.5 cm (1¼ inch) in the cod end liner. Water temperature was usually recorded daily with a temperature logger attached to the trawl headrope.

Catch Sampling

The net contents from successful tows were brought aboard and weighed. All Tanner, king, and Dungeness crabs were sorted by sex and species and then weighed. Carapace widths were measured

for Tanner and Dungeness crabs, and carapace lengths were measured for king crabs. Shell age was recorded as soft, new, old, or very old for all crab (Table 1; Kimker 1996*a*). Soft and new shells are believed to have molted after the most recent winter. In contrast, old and very old shells are believed to have been retained for one or more years. Females were assessed for maturity, egg condition, and clutch size. Determination of maturity was based on carapace size and the firmness of the connection between the abdomen and the thorax.

Data Analysis

For each district and target species, the population, measured in either abundance or biomass, was estimated from the following area swept equation:

$$P_i = 151.9 \times \sum_{i=1}^{n} \left(A_i \times \frac{C_i}{l_i} \right),$$

where

151.9 = a factor, obtained by dividing 6,076 feet per nautical mile by the 40-foott width of the net, used to convert the catch per nautical mile towed to animals per square nautical mile;

A_i = surface area of station i in square nautical miles;

C_i = catch of a species, either in abundance or weight, in the sample tow of area i;

l_i = distance towed, in nautical miles, in area i .

Because only successfully sampled survey stations were included in the aggregated estimate, population estimates were considered to be conservatively biased (i.e. the actual population was probably underestimated). Population estimates were not calculated for king crab because of their low abundance and patchy distribution.

Crab growth rates often vary by area across the geographic distribution of a given species but tend to be consistent within a given management area. Crab carapace widths were classified into estimated "age" categories based on previous studies of Cook Inlet crab resources. For this report, soft and new shells were pooled into a single "new" category whereas "old" and "very old" shells were pooled into a single "old" category (Table 1; Kimker 1996*a*). Mean carapace sizes were calculated by weighting size frequency distributions from each survey station by the surface area of that survey station.

RESULTS

Southern District

A total of 19 successful tows were made in the Southern District during 17-20 August 1996 (Appendix A; Table 2). The aggregate catch from all tows was 36,434 lb, which included 2,177 lb of Tanner crab, 52 lb of king crab, 597 lb of Dungeness crab, and 15 lb of weathervane scallops. Twenty percent, or 6,470 lb, of the aggregate catch consisted of commercially important groundfish species: Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), rockfish (*Sebastes* spp.), and sablefish (*Anoplopoma fimbria*).

Tanner Crab

A total of 1,725 male Tanner crab were caught in the Southern District (Table 4). Male carapace widths ranged from 11-163 mm (0.4-6.4 inch; Table 5). Mean male carapace width was 89.4 mm (3.5 inch), and legal males had an average width of 147 mm (5.8 inch). Sublegal crab comprised 94%, , and prerecruit-1 and -2 crab comprised 77% of the male catch. Legal males comprised only 6% of the male catch, with new recruits contributing just 3% (57 crab) of the legal male population. No postrecruit males (>165 m) were caught. The Southern District was estimated to contain 1,284,860 male Tanner crab vulnerable to trawl survey gear (Table 5; Figure 4). The estimated number of legal males was 93,662 Tanner crab, or 7% of the total male population estimate.

A total of 914 female Tanner crab were caught in the Southern District survey (Table 8). Juveniles comprised 31% (n=285) of the catch. About 95% of the total female catch and 78% of the adult female catch had new shells. Only 6 of the mature females were barren, and nearly 70% of mature females had full clutches. Eggs in all clutches were uneyed. Female carapace widths ranged from 16-121 mm (0.6-4.8 inch; Table 11; Figure 7). Mean female carapace width was 71.6 mm (2.8 inch), and mature females had a mean width of 98.5 mm (3.9 inch). The Southern District was estimated to contain 674,257 female Tanner crab vulnerable to survey gear (Tables 9 and 10; Figure 8). The estimated number of mature females was 451,068 Tanner crab, or 67% of the total estimated female population.

King Crab

The 1996 Southern District survey yielded only five male king crab from three stations (Tables 12 and 13). Two of these crab had new shells. Four of the males were caught at the upper end of Kachemak Bay: three males were postrecruits and one was an old shell recruit. A single juvenile with a 91 mm (3.6 inch) carapace was caught adjacent to the Homer Spit (Table 7). Carapace length of the five males ranged from 91-192 mm (3.6-7.6 inch), and mean length was 142.9 mm (5.6 inch).

Two female king crab were caught in the Southern District; both from east of the Homer Spit. Both females were barren; one had a109 mm (4.3 inch) new shell and the second had a 183 mm (7.21 inch) old shell (Tables 11, 14, and 15).

Dungeness Crab

Only 176 male Dungeness crab were captured in the Southern District survey (Tables 16 and 17). Male carapace widths ranged from 119 to 180 mm (4.7-7.1 inch), and mean width was 161.8 mm (6.4 inch; Table 7; Figure 9). Legal males comprised 33% (n=58) of the catch. Half of the legal males had new shells. Skip molts comprised 56% (n=56) of prerecruit-1 and 84% (n=16) of prerecruit-2 crab. No soft-shell males were caught.

A total of 370 female Dungeness crab were caught in the Southern District (Tables 18 and 19). Female Dungeness carapace widths ranged from 106-168 mm (4.2-6.6 inch), and mean width was 138.8 mm (5.5 inch; Table 11; Figure 10). Based on observed carapace widths, all female Dungeness were assumed to be mature, although none were egg-bearing.

Kamishak and Barren Islands Districts

A total of 19 successful tows were made in the Kamishak and Barren Islands Districts during 20-23 June 1996 (Appendix B; Table 3). Data from one additional tow, station 42, was discarded because a large tear in the net may have biased the catch. Aggregate catch from all tows was 24,036 lb, which included 1,306 lb of Tanner, 120 lb of king, and 309 lb of weathervane scallops; no Dungeness crab were caught. Twenty-three percent, or 5,439 lb, of the aggregate catch was comprised of Pacific cod, walleye pollock, rockfish, and sablefish.

Tanner Crab

A total of 1,091 male Tanner crab were caught in the Kamishak and Barren Islands Districts (Table 20). Male carapace widths ranged from 17-169 mm (0.7-6.6 inch; Table 7; Figure 11). Mean male carapace width was 97.6 mm (3.8 inch), and mean width of legal males was 145.5 mm (5.7 inch). Sublegal crab comprised 90%, and prerecruit-1 and -2 crab comprised 71%, of the male catch. Legal males comprised only 10% of the males, and new recruits comprised only 2% (n=24) of the legal male catch. Only one postrecruit male (>165 m) was caught. The Kamishak and Barren Islands Districts were estimated to contain 4,208,580 male Tanner crab vulnerable to trawl survey gear (Tables 6 and 21; Figure). Estimated abundance of legal males was 407,897 crab, or 10% of the total estimated male population.

A total of 199 female Tanner crab were caught in the Kamishak and Barrens Islands Districts survey (Table 22). Juveniles comprised 81% (n=161) of the total catch. New shells comprised 8% of the mature females (Figure 13). Only one mature female was barren and 89% of the mature females had full clutches; eggs in all clutches were uneyed. Female carapace widths ranged from 17-100 mm (0.7-3.9 inch; Table 11; Figure 12). Mean carapace width was 55.1 mm (2.2 inch) and mean width of mature females was 91.9 mm (3.6 inch). The Kamishak and Barrens Islands Districts contained an estimated 788,407 female Tanner crab vulnerable to the survey gear (Tables 10 and 23). Mature females totaled 150,670 crab, or 19% of the estimated female population.

King Crab

The 1996 survey of the Kamishak and Barren Islands Districts yielded a total of 31 male king crab from two stations located east of Augustine Island (Figure 3; Tables 12 and 13). Only two males were legal size (145 mm; 5.7 inch); one male had an old shell with a carapace length of 151 mm (6.0 inch) and the other had a new shell with a carapace length of 183 mm (7.2 inch). Most of the survey catch was comprised of prerecruit-3 (n=12) and -2 (n=14) crab, all of which had new shells. Male carapace lengths (Table 7) ranged from 100-183 mm (3.9-7.2 inch), and mean length was 118.5 mm (4.7 inch).

Nine female king crab were caught at two stations east of August Island in the Kamishak and Barren Islands Districts (Tables 14 and 15). All females had new shells, and all mature females had partial clutches. Female carapace lengths ranged from 95-121 mm (3.7-4.8 inch), and mean length was 108.2 mm (4.3 inch; Table 11).

Bottom Temperature

Bottom water temperatures measured during two trawl tows in the Southern District were 9.2 C and 9.7 C (Appendix C). Temperatures ranged from 5.5-8.3 C during four tows in the Kamishak and Barrens Islands survey; and mean temperature was 7.3 C. Temperature decreased with increased depth within a district. However, the two-month difference between district surveys in 1996 made temperatures comparisons problematic.

DISCUSSION

Tanner Crab

Estimated abundance of legal-size Tanner crab in the Southern District continued to be insufficient to support a commercial fishery. Limited commercial fisheries occurred in the Southern District from

1991 through 1994 (Kimker 1996*b*). Trawl surveys documented a decline in Tanner crab abundance from >2.5 million males in the early 1990s to <0.9 million in 1994 (Table 6; Figure 6). Although this was followed by a modest increase in recent years to almost1.3 million male crab in 1996, the number of legal males has generally continued to decline. This was most apparent for postrecruit Tanner crab which were absent from Southern District samples in 1996.

In the Kamishak and Barren Islands Districts, commercial Tanner crab fisheries have remained closed since 1992. Although the 1996 population estimate of 407,897 legal male Tanner crab was the second greatest observed since the trawl survey began, total abundance and age composition continues to be insufficient to support a commercial fishery (Table 6). Over 78% of the crab sampled had old shells. Postrecruit crab were only captured in three trawl surveys. Old shell recruits have outnumbered new recruits, and old prerecruit-1 crab have outnumbered new prerecruit-1 crab in 6 of the 7 survey years. The sequence of years when new shell outnumbered old shell crabs may be attributable to a strong cohort moving through the population, as indicated by the sequential abundances of prerecruit-3 crab in 1992, new prerecruit-2 in 1993, new prerecruit-1 in 1994, new recruits in 1995, and old recruits in 1996 (Figure 7). Similar results have been obtained for trawl surveys conducted south of the latitude of Cape Douglas by ADF&G's Kodiak staff (Al Kimker, ADF&G, Homer, personal communication).

Old shell crab are thought to have skipped at least one molt. These "skip-molt" crab may suffer greater natural mortality than their molting cohorts due to their inability to replace lost appendages and to shed parasites or diseases associated with old shells. Many old shell crab, particularly those with very old shells, appeared to be less vigorous than new shell crab. Although shell aging is highly subjective, particularly in the Southern District east of the Homer Spit, there may be a terminal molt when crab reach reproductive size and fail to molt to a larger size. Paul and Paul (1990) showed that Tanner crab are capable of reproducing at a size substantially smaller than legal recruitment. If fishing removes a large proportion of legal size males, selective pressures may favor crab which reproduce before they attain legal size. Failure of prerecruit crabs to attain legal size, despite the lack of a commercial fishery for several years, indicates this phenomona may have occurred.

Some of the annual variation observed in cohort abundance may be due to gear selectivity rather than actual changes in abundance. For example, trawl survey selectivity increases with cohort age due to factors such as trawl mesh size, crab size, and crab distribution. Estimated annual abundance of prerecruit-4 crab may be particularlyaffected by this problem because survey gear selectivity is likely much lower for this size group than for larger size classes (Table 6).

Another important indicator of stock status is the percentage of mature and egg-bearing females. In both 1996 surveys, most mature females were egg-bearing (Tables 10 and 21). The occurrence of some barren females with very old shells was not considered unusual and is consistent with senescent females approaching the end of their natural life cycle. Although 66.9% of the females caught in the 1996 Southern District survey were mature, the greatest percentage on record, this likely indicates a drastic decline in juvenile female Tanner crab in survey catches rather than an increase in the number of mature females (Table 9). In the Kamishak and Barren Islands Districts, only 19.1% of the females were mature. This was a marked decline from recent years, and the second lowest percentage on record. If low abundance of mature females is not a survey anomaly, then reproductive capacity of this

population will decline until the apparently abundant juvenile female population matures.

Historical pot and trawl survey data exhibit a positive bias for encountering male Tanner crab (Table 6 and 10; Kimker 1996*a*). This bias likely resulted from two factors: 1) surveys emphasized stations that historically yielded the best catches of male Tanners in both past surveys and commercial fisheries; and 2) stations that had not historically produced large catches of male crab were eliminated from surveys when bad weather or gear losses reduced available vessel time.

King crab

Compared to historical commercial catch data, which only provide numbers of legal males, survey results indicate the overall population level of king crabs remains severely depleted in both the Southern and Kamishak and/Barren Islands Districts (Table 13). The mean annual commercial catch prior to the final 1984 closure was 3.44 million lb (Kimker 1996*b*). Assuming an average weight of 6.5 pounds per crab, this represented an annual removal of approximately 0.5 million legal males. In contrast, king crab catches during the 1996 trawl survey were considered too low to use to generate a meaningful estimate of population abundance. Although the 31 king crab caught in 1996 was a record for the Kamishak and Barren Islands Districts trawl survey and may indicate some stock rebuilding, continued increases will needed to be documented to confirm this rebuilding.

Dungeness crab

Southern District trawl surveys in the early 1990s documented a group of Dungeness males as they moved through the population in successive years (Table 17). Although the trawl survey was not designed to assess Dungeness crab, these data seem to agree with results of Southern District Dungeness pot surveys (Al Kimker, ADF&G, Homer, personal communication). Trawl data indicated a large reduction of these males in 1994 and 1995 as both natural mortality and recreational fishing mortality increased. The 1995 and 1996 trawl surveys also indicated the presence of a cohort moving from the prerecruit-2 to the prerecruit-1 size class. Although notable, this cohort's abundance is well below abundances observed in the early 1990s.

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Table 1. Carapace widths (mm) used to determine crab size classes in Cook Inlet.

Class	Prerecruit				Recruit	Postrecruit
	Pre-4	Pre-3	Pre-2	Pre-1		
	Tanner Crab					
Width	<70	70-91	92-114	115-139	140-165	>165
	King Crab					
Width	<91	92-108	109-126	127-144	145-163	>163
	Dungeness Crab					
Width	<89	90-114	115-139	140-164	165-189	>189

Table 2. Catch biomass per nautical mile tow for target species in the Southern District, Cook Inlet during the 17-20 August 1996 trawl survey.

Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Total
	Round Weight (lb)								
1	10	12	8	0	18	124	0	0	172
2	9	1	34	0	4	4	0	0	52
3	58	10	0	2	0	206	0	0	276
4	44	1	0	1	28	244	1	0	319
5	3	1	0	0	0	0	0	0	4
6	210	12	0	1	38	74	0	0	335
7	78	0	10	4	2	90	0	2	186
8	4	326	0	0	90	42	8	0	470
9	0	484	0	0	18	132	24	0	658
10	0	58	0	2	28	642	10	2	742
11	0	776	0	4	0	0	0	0	780
12	0	88	0	1	14	1,386	0	1	1,490
13	3	207	0	0	60	90	5	3	284
14	4	0	0	0	24	2,827	0	0	2,855
15	6	92	0	0	0	134	0	0	232
17	7	0	0	0	0	0	0	0	7
18	10	0	0	0	8	8	0	0	26
20	6	0	0	0	16	0	0	0	22
71	146	192	0	0	20	40	1	2	401
Total	597	2,177	52	15	368	6,043	49	10	9,311

Table 3. Catch biomass per nautical mile tow for target species caught from Kamishak Bay during the 20-23 June 1996 trawl survey.

Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Total
	Round Weight (lb)								
27	0	0	0	1	80	16	0	0	97
28	0	2	0	1	96	503	0	0	602
32	0	90	0	6	124	78	0	0	298
33	0	45	0	32	118	88	0	1	284
37	0	116	76	158	84	0	0	0	434
38	0	1	0	0	20	0	0	0	21
41	0	112	0	0	20	1	0	0	133
42	0	0	0	0	84	0	0	0	84
43	0	2	0	0	26	4	0	0	32
44	0	207	44	96	202	4	0	0	553
47	0	12	0	0	146	82	0	0	240
48	0	20	0	1	104	8	0	2	135
50	0	14	0	1	76	0	0	0	91
51	0	548	0	12	22	150	1	0	733
53	0	62	0	0	60	1,608	0	2	1,732
54	0	0	0	0	52	0	0	0	52
55	0	3	0	1	40	913	0	0	957
58	0	46	0	0	274	140	4	0	464
67	0	3	0	0	80	8	0	0	91
68	0	23	0	0	102	16	0	0	141
Total	0	1,306	120	309	1,810	3,619	5	5	7,174

Table 4. Catch of male Tanner crab by shell age and size per nautical mile towed during a trawl survey of the Southern District, Cook Inlet, August 1996.

Survey Station	Sublegal Males						Legal Males				Total Legal	Total Males
			Pre-2		Pre-1		Recruit		Postrecruit			
	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)		
1	9	2	1	1	1	0	1	1	0	0	2	16
2	1	0	0	0	0	0	0	0	0	0	0	1
3	1	2	7	0	2	0	0	0	0	0	0	12
4	3	0	0	0	0	0	0	0	0	0	0	3
5	4	0	0	0	0	0	0	0	0	0	0	4
6	59	0	4	0	1	1	0	0	0	0	0	65
7	57	1	0	0	0	0	0	0	0	0	0	58
8	4	8	80	70	57	52	3	3	0	0	6	277
9	12	4	52	20	97	20	13	9	0	0	22	227
10	45	8	1	3	9	9	1	5	0	0	6	81
11	38	22	284	23	253	21	15	3	0	0	18	659
12	2	3	2	6	10	7	8	7	0	0	15	45
13	0	1	9	9	26	22	6	5	0	0	11	78
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	1	3	12	13	5	11	0	0	16	45
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	1	0	0	0	0	0	0	0	1
71	1	3	10	47	25	60	5	2	0	0	7	153
District Total												
Total	236	54	451	183	493	205	57	46	0	0	103	1,725
Percent	14%	3%	26%	11%	29%	12%	3%	3%	0%	0%	6%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 5. Population estimate by shell age and size for male Tanner crab in the Southern District, Cook Inlet, August 1996.

Survey Station	Sublegal Males						Legal Males				Total Legal	Total Males
			Pre-2		Pre-1		Recruit		Postrecruit			
	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)		
1	6,804	1,512	756	756	756	0	756	756	0	0	1,512	12,096
2	443	0	0	0	0	0	0	0	0	0	0	443
3	838	1,676	5,866	0	1,676	0	0	0	0	0	0	10,056
4	1,401	0	0	0	0	0	0	0	0	0	0	1,401
5	3,608	0	0	0	0	0	0	0	0	0	0	3,608
6	44,781	0	3,036	0	759	759	0	0	0	0	0	49,335
7	34,004	596	0	0	0	0	0	0	0	0	0	34,600
8	2,168	4,336	43,367	37,950	30,896	28,189	1,626	1,626	0	0	3,252	150,158
9	8,364	2,788	36,246	13,940	67,616	13,940	9,061	6,273	0	0	15,334	158,228
10	58,231	10,352	1,294	3,882	11,646	11,646	1,294	6,470	0	0	7,764	104,815
11	26,714	15,466	199,700	16,170	177,898	14,764	10,545	2,109	0	0	12,654	463,366
12	1,898	2,847	1,898	5,694	9,490	6,643	7,592	6,643	0	0	14,235	42,705
13	0	1,582	14,238	14,238	41,132	34,804	9,492	7,910	0	0	17,402	123,396
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	1,117	3,351	13,405	14,525	5,585	12,291	0	0	17,876	50,274
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	949	0	0	0	0	0	0	0	949
71	519	1,557	5,190	24,402	12,976	31,153	2,595	1,038	0	0	3,633	79,430
District Total												
Total	189,773	42,712	312,708	121,332	368,250	156,423	48,546	45,116	0	0	93,662	1,284,860
Percent	15%	3%	24%	9%	29%	12%	4%	4%	0%	0%	7%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 6. Historical population estimates by carapace length and age for male Tanner crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1996.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	453,024	682,569	541,891	9,492	403,015	37,055	137,235	163,961	12,081	53,504	366,781	2,493,827
1991	316,529	295,026	826,589	35,265	790,463	117,838	279,543	187,509	45,587	24,084	536,723	2,918,433
1992	306,159	134,137	438,453	34,688	683,607	205,970	740,136	138,101	49,547	26,155	953,939	2,756,953
1993	599,873	89,299	120,343	12,548	215,292	109,962	280,719	185,496	41,158	16,946	524,319	1,671,636
1994	258,118	169,986	114,102	8,572	95,260	58,967	65,675	94,138	6,726	20,633	187,172	892,177
1995	372,035	356,327	449,225	17,330	386,004	37,399	157,383	62,421	6,049	9,466	235,319	1,853,639
1996	189,773	42,712	312,708	121,332	368,250	156,423	48,546	45,116	0	0	93,662	1,284,860

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1,831,889	332,005	535,114	429,654	257,792	2,085,775	105,461	488,244	0	0	593,705	6,065,934
1991	230,638	155,084	286,310	91,460	357,887	1,053,779	39,765	330,052	0	0	369,817	2,544,975
1992	251,834	552,348	360,846	233,671	166,434	1,236,465	19,629	193,576	0	3,968	217,173	3,018,771
1993	298,382	151,385	523,487	211,521	137,821	530,615	23,387	87,287	0	0	110,674	1,963,885
1994	200,254	852,801	1,168,971	431,525	916,511	673,005	51,582	126,964	0	3,968	182,514	4,425,581
1995	47,256	422,861	841,368	502,175	733,399	875,308	171,912	71,418	0	0	243,330	3,665,697
1996	681,961	162,180	297,593	366,916	730,491	1,561,542	88,162	315,768	0	3,967	407,897	4,208,580

Carapace widths (mm) used for Tanner crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	71-90	91-114	115-139	140-165	>165

Table 7. Maximum, minimum, and mean carapace width of male Tanner, king, and Dungeness crabs caught in trawl surveys of Cook Inlet, 1996.

Southern District

Station	Area (nmi^2)	Tanner Crab			King Crab			Dungeness Crab		
		Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
		Crab Carapace Width (mm)								
1	4.98	34	152	79.5	172	172	172.0	153	176	163.3
2	2.92	43	43	43.0	163	192	175.0	141	178	160.8
3	5.52	66	123	97.3				137	172	156.4
4	3.08	34	46	40.7				138	173	158.4
5	5.94	23	44	33.8						
6	5.00	11	137	38.4				119	178	154.3
7	3.93	23	74	40.9	91	91	91.0	141	178	157.0
8	3.57	52	150	111.4						
9	4.59	46	162	115.7						
10	8.52	26	162	86.7						
11	4.63	35	162	108.2						
12	6.25	24	154	122.3						
13	6.25	89	156	125.2				158	158	158.0
14	6.64							180	180	180.0
15	3.68	110	163	134.8						
17	8.94									
18	6.25									
20	6.25	108	108	108.0						
71	3.42	67	148	116.3				133	178	160.8
Weighted District Means				89.4			142.9			161.8

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Station	Area (nmi^2)	Tanner Crab			King Crab			Dungeness Crab		
		Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
		Crab Carapace Width (mm)								
27	26.12	111	111	111.0						
28	26.12	23	132	64.9						
32	26.12	22	143	104.9						
33	26.12	22	141	92.8						
37	26.12	90	153	120.4	101	142	114.4			
38	26.12	98	105	101.5						
41	16.84	77	162	124.9						
42	17.00									
43	24.75	22	123	89.5						
44	26.12	79	158	118.2	100	183	122.5			
47	26.12	52	130	100.8						
48	26.12	53	152	115.5						
50	26.12	99	153	131.4						
51	26.12	18	169	126.4						
53	26.12	78	150	125.4						
54	26.12	71	71	71.0						
55	26.12	17	127	37.6						
58	24.74	55	140	121.2						
67	26.12	19	128	43.6						
68	26.12	19	148	62.9						
Weighted District Means				97.6			118.5			

Table 8. Catch per nautical mile towed of female Tanner crab by carapace age and clutch fullness in a trawl survey of the Southern District, Cook Inlet, August 1996.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	17	0	0	0	0	0	0	0	0	0	0	0	0	17
2	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3	0	0	0	0	1	0	0	0	0	0	1	0	0	1
4	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5	2	0	0	0	0	0	0	0	0	0	0	0	0	2
6	50	0	0	0	0	0	0	0	0	0	0	0	0	50
7	44	0	0	0	0	0	0	0	0	0	0	0	0	44
8	21	53	23	1	7	1	5	1	0	0	61	24	6	112
9	20	150	30	31	80	8	4	2	0	0	232	38	35	325
10	51	3	2	0	1	1	0	0	0	0	4	3	0	58
11	59	97	10	1	43	1	1	2	0	0	142	11	2	214
12	6	19	1	1	12	2	0	0	0	1	31	3	2	42
13	0	8	0	0	4	0	0	0	0	0	12	0	0	12
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	2	1	0	5	0	0	0	0	0	7	1	0	8
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	9	1	1	7	2	2	4	0	0	0	3	3	11	26
District Total														
Abund.	282	333	68	41	155	15	14	5	0	1	493	83	56	914
Percent	31%	36%	7%	4%	17%	2%	2%	1%	0%	0%	54%	9%	6%	100%

Table 9. Population estimate by carapace condition and clutch fullness for female Tanner crab in the Southern District, Cook Inlet, August 1996.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	12,835	0	0	0	0	0	0	0	0	0	0	0	0	12,835
2	443	0	0	0	0	0	0	0	0	0	0	0	0	443
3	0	0	0	0	837	0	0	0	0	0	837	0	0	837
4	934	0	0	0	0	0	0	0	0	0	0	0	0	934
5	1,802	0	0	0	0	0	0	0	0	0	0	0	0	1,802
6	37,950	0	0	0	0	0	0	0	0	0	0	0	0	37,950
7	26,224	0	0	0	0	0	0	0	0	0	0	0	0	26,224
8	11,361	28,673	12,443	541	3,787	541	2,705	541	0	0	33,001	12,984	3,246	60,592
9	13,920	104,400	20,880	21,576	55,680	5,568	2,784	1,392	0	0	161,472	26,448	24,360	226,200
10	65,943	3,879	2,586	0	1,293	1,293	0	0	0	0	5,172	3,879	0	74,994
11	41,418	68,094	7,020	702	30,186	702	702	1,404	0	0	99,684	7,722	1,404	150,228
12	5,688	18,012	948	948	11,376	1,896	0	0	0	948	29,388	2,844	1,896	39,816
13	0	12,648	0	0	6,324	0	0	0	0	0	18,972	0	0	18,972
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	2,234	1,117	0	5,585	0	0	0	0	0	7,819	1,117	0	8,936
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	4,671	519	519	3,633	1,038	1,038	2,076	0	0	0	1,557	1,557	5,709	13,494
Southern District Total														
Abund.	223,189	238,459	45,513	27,400	11,610	611,038	8,267	3,337	0	948	357,902	56,551	36,615	674,257
Percent	33%	35%	7%	4%	2%	90%	1%	0%	0%	0%	53%	8%	5%	100%

Table 10. Historical population estimates for female Tanner crab caught in Cook Inlet bottom trawl surveys, 1990-1996.

Southern District

Year	Juvenile	Mature	Total	% Mature
	Estimated Abundance			
1990	919,907	393,506	1,313,413	30.0%
1991	519,521	914,322	1,433,843	63.8%
1992	350,782	533,748	884,530	60.3%
1993	573,958	600,634	1,174,592	51.1%
1994	515,136	373,041	888,177	42.0%
1995	609,577	676,352	1,285,929	52.6%
1996	223,189	451,068	674,257	66.9%
			Average	52.4%

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Year	Juvenile	Mature	Total	
	Estimated Abundance			
1990	2,140,458	499,961	2,640,419	18.9%
1991	326,075	87,484	413,559	21.2%
1992	453,343	217,801	671,144	32.5%
1993	389,426	826,705	1,216,131	68.0%
1994	490,030	944,491	1,434,521	65.8%
1995	195,451	479,970	675,421	71.1%
1996	637,737	150,670	788,407	19.1%
			Average	42.4%

Table 11. Maximum, minimum, and mean carapace width of female Tanner, king, and Dungeness crabs caught in trawl surveys of Cook Inlet, 1996.

Southern District

Station	Area (nmi^2)	Tanner Crab Min.	Tanner Crab Max.	Tanner Crab Mean	King Crab Min.	King Crab Max.	King Crab Mean	Dungeness Crab Min.	Dungeness Crab Max.	Dungeness Crab Mean
		Crab Carapace Width (mm)								
1	4.98	42	93	64.0						
2	2.92	43	43	43.0	109	109	109.0	117	117	117.0
3	5.52	99	99	99.0				113	159	130.4
4	3.08	24	37	30.5				113	160	127.6
5	5.94	39	50	44.5				149	158	153.5
6	5.00	16	68	34.5				110	164	133.3
7	3.93	22	53	34.7	183	183	183.0	108	168	137.9
8	3.57	54	117	94.5				140	165	150.0
9	4.59	58	121	95.9						
10	8.52	26	109	51.3						
11	4.63	28	119	89.0						
12	6.25	23	113	94.2						
13	6.25	86	108	97.5				117	117	
14	6.64							119	119	
15	3.68	99	106	103.0				133	157	
17	8.94							144	167	
18	6.25							142	167	
20	6.25									
71	3.42	54	111	91.5				106	167	
Weighted District Means				71.6			151.5			138.8

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Station	Area (nmi^2)	Tanner Crab Min.	Tanner Crab Max.	Tanner Crab Mean	King Crab Min.	King Crab Max.	King Crab Mean	Dungeness Crab Min.	Dungeness Crab Max.	Dungeness Crab Mean
		Crab Carapace Width (mm)								
27	26.12									
28	26.12	24	57	37.5						
32	26.12	54	75	65.3						
33	26.12	54	78	66.8						
37	26.12	79	102	91.2	107	121	112.2			
38	26.12									
41	16.84									
42	17.00									
43	24.75	27	27	27.0						
44	26.12	74	92	83.3	95	108	104.3			
47	26.12	57	57	57.0						
48	26.12									
50	26.12									
51	26.12	23	100	86.7						
53	26.12	52	52	52.0						
54	26.12									
55	26.12	17	84	37.1						
58	24.74	25	53	39.0						
67	26.12	18	85	38.8						
68	26.12	20	58	32.8						
Weighted District Means				55.1			108.2			

Table 12. Station catch per nautical mile by carapace length and age of male king crab caught in trawl surveys of the Cook Inlet Management Area, 1996.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station[a]	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1	0	0	0	0	0	0	1	0	0	0	1	1
2	0	0	0	0	0	0	0	2	0	1	3	3
7	0	1	0	0	0	0	0	0	0	0	0	1
District Total												
Abund.	0	1	0	0	0	0	1	2	0	1	4	5
Percent	0%	20%	0%	0%	0%	0%	20%	40%	0%	20%	80%	100%

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	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station[a]	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
37	0	8	11	0	2	0	0	0	0	0	0	21
44	0	4	3	0	1	0	0	1	1	0	2	10
District Total												
Abund.	0	12	14	0	3	0	0	1	1	0	2	31
Percent	0%	39%	45%	0%	10%	0%	0%	3%	3%	0%	6%	100%

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

Table 13. Historical catch per nautical mile by carapace length and age for male king crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1996.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	0	1	0	0	0	0	0	0	1	2	3	4
1991	0	0	0	0	1	0	18	3	69	14	104	105
1992	0	2	2	0	0	0	1	1	11	31	44	48
1993	0	2	5	0	0	0	1	0	5	2	8	15
1994	4	0	0	0	0	0	0	0	1	6	7	11
1995	0	0	0	0	0	0	0	0	1	2	3	3
1996	0	1	0	0	0	0	0	1	1	2	4	5

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	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	0	0	0	1	0	2	0	1	1	4	6
1991	0	0	0	0	0	0	0	1	2	4	7	7
1992	0	2	1	0	1	0	2	2	8	10	22	26
1993	1	0	0	0	0	0	0	0	1	0	1	2
1994	0	0	0	0	0	0	0	0	1	2	3	3
1995	1	2	0	0	0	0	1	0	1	1	3	6
1996	0	12	14	0	3	0	0	1	1	0	2	31

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

Table 14. Station catch per nautical mile by maturity and clutch size for female king crab in trawl surveys of Cook Inlet, 1996.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Station[a]	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
2	0	0	0	0	0	0	0	1	0	0	1	0	0	1
7	0	0	0	0	0	0	0	0	0	1	0	0	1	1
District Total														
Abund.	0	0	0	0	0	0	0	1	0	1	1	0	1	2
Percent	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	50%	0%	50%	100%

Kamishak and Barren Islands Districts Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Station[a]	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
37	1	0	0	0	4	0	0	0	0	0	4	0	0	5
44	1	0	0	0	3	0	0	0	0	0	3	0	0	4
District Total														
Abund.	2	0	0	0	7	0	0	0	0	0	7	0	0	9
Percent	22%	0%	0%	0%	78%	0%	0%	0%	0%	0%	78%	0%	0%	100%

[a] - Stations not listed had no catch of female king crab.

Table 15. Historical catch per nautical mile of female king crab in trawl surveys of Cook Inlet, 1990-1996.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	2	0	0	0	0	0	0	0	0	0	0	0	0	2
1991	0	0	0	0	8	0	0	0	0	0	8	0	0	8
1992	1	19	0	0	59	0	0	2	0	0	80	0	0	81
1993	3	3	0	0	14	1	0	0	0	0	17	1	0	21
1994	6	2	0	0	2	0	0	0	0	0	4	0	0	10
1995	0	0	0	0	1	0	0	0	0	0	1	0	0	1
1996	0	0	0	0	0	0	0	1	0	1	1	0	1	2

Kamishak and Barren Islands Districts Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	0	3	0	0	1	0	0	0	0	0	4	0	0	4
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	1	0	0	0	2	0	0	1	0	0	3	0	0	4
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	4	0	0	0	0	0	0	0	0	0	0	0	0	4
1996	2	0	0	0	7	0	0	0	0	0	7	0	0	9

Table 16. Station catch per nautical mile by carapace width and age for male Dungeness crab in a trawl survey of the Southern District, Cook Inlet, August 1996.

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	0	0	0	0	1	2	0	0	1	3	4	7
2	0	0	0	0	2	1	0	0	1	1	2	5
3	0	0	0	1	3	14	0	0	2	4	6	24
4	0	0	1	0	1	5	1	1	0	3	5	12
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	2	13	23	23	0	0	17	5	22	83
7	0	0	0	0	10	1	0	0	4	1	5	16
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	1	0	0	0	0	0	1
14	0	0	0	0	0	0	0	0	0	1	1	1
15	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	2	3	9	0	0	3	10	13	27
						District Total						
Total	0	0	3	16	43	56	1	1	28	28	58	176
Percent	0%	0%	2%	9%	24%	32%	1%	1%	16%	16%	33%	100%

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 17. Historical catch per nautical mile by carapace length and age for male Dungeness crab caught in trawl surveys of the Southern District, Cook Inlet, 1990-1996.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	17	189	5	91	7	6	1	0	0	7	317
1991	0	1	15	2	158	12	45	1	0	0	46	234
1992	0	0	19	2	93	31	54	10	1	1	66	211
1993	0	0	0	3	50	7	67	9	0	0	76	136
1994	0	0	2	0	7	3	13	12	0	0	25	37
1995	0	2	97	1	46	3	5	5	0	0	10	159
1996	0	0	3	16	43	56	1	1	28	28	58	176

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 18. Station catch per nautical mile by carapace age and clutch fullness for female Dungeness crab in a trawl survey of the Southern District, Cook Inlet, August 1996.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	1	0	0	1	1
3	0	0	0	0	0	0	0	1	10	14	1	10	14	25
4	0	0	0	0	0	0	0	2	22	8	2	22	8	32
5	0	0	0	0	0	0	0	0	0	2	0	0	2	2
6	0	0	0	0	0	0	0	29	66	37	29	66	37	132
7	0	0	0	0	0	0	0	28	22	4	28	22	4	54
8	0	0	0	0	0	0	0	0	0	4	0	0	4	4
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	1	0	0	1	0	1
14	0	0	0	0	0	0	0	0	1	0	0	1	0	1
15	0	0	0	0	0	0	0	5	0	0	5	0	0	5
17	0	0	0	0	0	0	0	0	4	0	0	4	0	4
18	0	0	0	0	0	0	0	1	5	0	1	5	0	6
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	30	36	37	30	36	37	103
District Total														
Abund.	0	0	0	0	0	0	0	96	167	107	96	167	107	370
Percent	0%	0%	0%	0%	0%	0%	0%	26%	45%	29%	26%	45%	29%	100%

Table 19. Historical catches of female Dungeness crab in trawl surveys of the Southern District, Cook Inlet, 1990-1996.

		Southern District Catches												
		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	NA[a/]	0	8	0	0	0	0	2	13	0	2	21	0	23
1991	0	37	7	0	8	2	0	408	14	0	453	23	0	476
1992	0	0	1	0	0	0	0	397	78	0	397	79	0	476
1993	7	0	0	0	0	0	0	377	150	0	377	150	0	534
1994	0	0	0	0	0	0	0	43	69	2	43	69	2	114
1995	0	8	1	1	0	0	0	105	10	0	113	11	1	125
1996	0	0	0	0	0	0	0	96	167	107	96	167	107	370

[a/] - Juveniles were not distinguished in the 1990 survey.

Table 20. Catch abundance by carapace size and age per mile towed of male Tanner crab during a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, June 1996.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
27	0	0	0	1	0	0	0	0	0	0	0	1
28	6	0	1	1	0	1	0	0	0	0	0	9
32	2	14	2	21	1	41	0	1	0	0	1	82
33	18	9	11	7	3	15	0	1	0	0	1	64
37	0	2	0	22	0	48	0	8	0	0	8	80
38	0	0	0	2	0	0	0	0	0	0	0	2
41	0	3	5	1	54	9	5	1	0	0	6	78
42	0	0	0	0	0	0	0	0	0	0	0	0
43	1	0	1	0	0	2	0	0	0	0	0	4
44	0	10	37	11	51	48	0	10	0	0	10	167
47	3	0	0	2	1	6	0	0	0	0	0	12
48	1	0	4	2	8	2	1	0	0	0	1	18
50	0	0	0	2	1	3	1	2	0	0	3	9
51	2	1	8	17	37	186	10	54	0	1	65	316
53	0	1	4	0	34	5	7	0	0	0	7	51
54	0	1	0	0	0	0	0	0	0	0	0	1
55	14	0	0	0	1	0	0	0	0	0	0	15
58	1	1	3	3	13	21	0	1	0	0	1	43
67	39	0	0	0	0	2	0	0	0	0	0	41
68	85	0	1	1	0	9	0	2	0	0	2	98
District Total												
Total	172	42	77	93	204	398	24	80	0	1	105	1,091
Percent	16%	4%	7%	9%	19%	36%	2%	7%	0%	0%	10%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 21. Population estimate of male Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, June 1996.

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
27	0	0	0	3,967	0	0	0	0	0	0	0	3,967
28	23,803	0	3,967	3,967	0	3,967	0	0	0	0	0	35,704
32	7,934	55,539	7,934	83,313	3,967	162,662	0	3,967	0	0	3,967	325,316
33	71,410	35,704	43,639	27,770	11,901	59,509	0	3,967	0	0	3,967	253,900
37	0	7,934	0	87,281	0	190,437	0	31,737	0	0	31,737	317,389
38	0	0	0	7,934	0	0	0	0	0	0	0	7,934
41	0	7,671	12,786	2,557	138,108	23,016	12,785	2,557	0	0	15,342	199,480
42	0	0	0	0	0	0	0	0	0	0	0	0
43	3,759	0	3,759	0	0	7,518	0	0	0	0	0	15,036
44	0	39,673	146,793	43,641	202,340	190,434	0	39,671	0	0	39,671	662,552
47	11,901	0	0	7,934	3,967	23,803	0	0	0	0	0	47,605
48	3,967	0	15,869	7,934	31,738	7,934	3,967	0	0	0	3,967	71,409
50	0	0	0	7,934	3,967	11,901	3,967	7,934	0	0	11,901	35,703
51	7,934	3,967	31,737	67,443	146,792	737,967	39,673	214,243	0	3,967	257,883	1,253,723
53	0	3,967	15,868	0	134,890	19,837	27,770	0	0	0	27,770	202,332
54	0	3,967	0	0	0	0	0	0	0	0	0	3,967
55	55,539	0	0	0	3,967	0	0	0	0	0	0	59,506
58	3,758	3,758	11,274	11,274	48,854	78,918	0	3,758	0	0	3,758	161,594
67	154,723	0	0	0	0	7,934	0	0	0	0	0	162,657
68	337,233	0	3,967	3,967	0	35,705	0	7,934	0	0	7,934	388,806
						District Total						
Total	681,961	162,180	297,593	366,916	730,491	1,561,542	88,162	315,768	0	3,967	407,897	4,208,580
Percent	16%	4%	7%	9%	17%	37%	2%	8%	0%	0%	10%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 22. Catch per nautical mile by carapace age and clutch fullness for female Tanner crab in a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1996.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	8	0	0	0	0	0	0	0	0	0	0	0	0	8
32	7	0	0	0	0	0	0	0	0	0	0	0	0	7
33	5	0	0	0	0	0	0	0	0	0	0	0	0	5
37	0	1	0	7	0	0	2	0	0	1	1	0	10	11
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	1	0	0	0	0	0	0	0	0	0	0	0	0	1
44	1	2	0	0	0	0	0	0	0	0	2	0	0	3
47	1	0	0	0	0	0	0	0	0	0	0	0	0	1
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	3	0	12	10	0	0	0	0	0	0	0	12	10	25
53	1	0	0	0	0	0	0	0	0	0	0	0	0	1
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	15	0	1	0	0	0	1	0	0	0	0	1	1	17
58	2	0	0	0	0	0	0	0	0	0	0	0	0	2
67	29	0	0	1	0	0	0	0	0	0	0	0	1	30
68	88	0	0	0	0	0	0	0	0	0	0	0	0	88
Kamishak and Barren Islands Districts Total														
Abund.	161	3	13	18	0	0	3	0	0	1	3	13	22	199
Percent	81%	2%	7%	9%	0%	0%	2%	0%	0%	1%	2%	7%	11%	100%

Table 23. Population estimate by carapace condition and clutch fullness of female Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, during June 1996.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	31,720	0	0	0	0	0	0	0	0	0	0	0	0	31,720
32	27,755	0	0	0	0	0	0	0	0	0	0	0	0	27,755
33	19,825	0	0	0	0	0	0	0	0	0	0	0	0	19,825
37	0	3,965	0	27,755	0	0	7,930	0	0	3,965	3,965	0	39,650	43,615
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	3,757	0	0	0	0	0	0	0	0	0	0	0	0	3,757
44	3,965	7,930	0	0	0	0	0	0	0	0	7,930	0	0	11,895
47	3,965	0	0	0	0	0	0	0	0	0	0	0	0	3,965
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	11,895	0	47,580	39,650	0	0	0	0	0	0	0	47,580	39,650	99,125
53	3,965	0	0	0	0	0	0	0	0	0	0	0	0	3,965
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	59,475	0	3,965	0	0	0	3,965	0	0	0	0	3,965	3,965	67,405
58	7,510	0	0	0	0	0	0	0	0	0	0	0	0	7,510
67	114,985	0	0	3,965	0	0	0	0	0	0	0	0	3,965	118,950
68	348,920	0	0	0	0	0	0	0	0	0	0	0	0	348,920
Kamishak and Barren Islands Districts Total														
Abund.	637,737	11,895	51,545	71,370	0	0	11,895	0	0	3,965	11,895	51,545	87,230	788,407
Percent	81%	2%	7%	9%	0%	0%	2%	0%	0%	1%	2%	7%	11%	100%

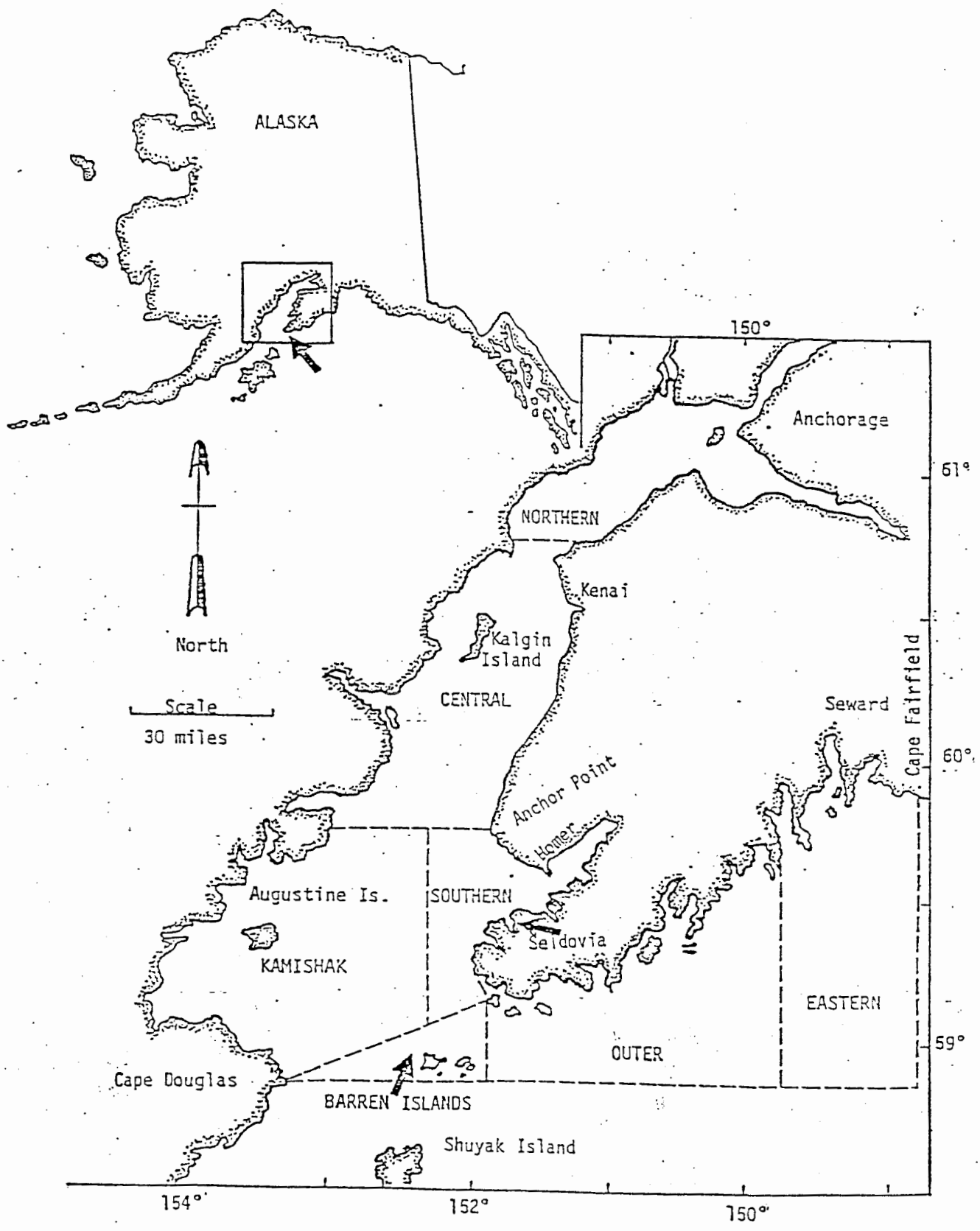

Figure 1 . Crab management districts in the Cook Inlet Management Area.

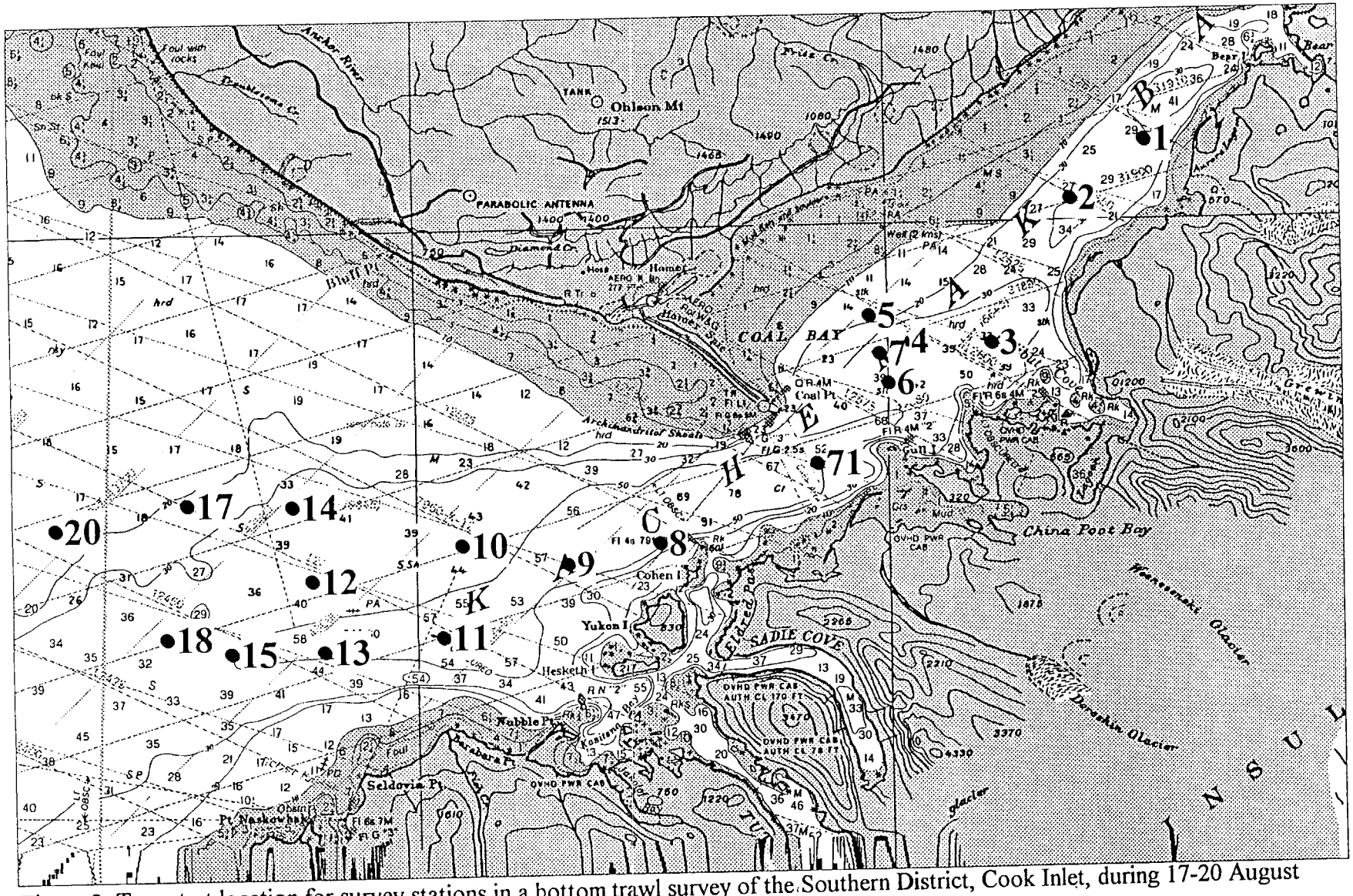

Figure 2. Tow start location for survey stations in a bottom trawl survey of the Southern District, Cook Inlet, during 17-20 August 1996.

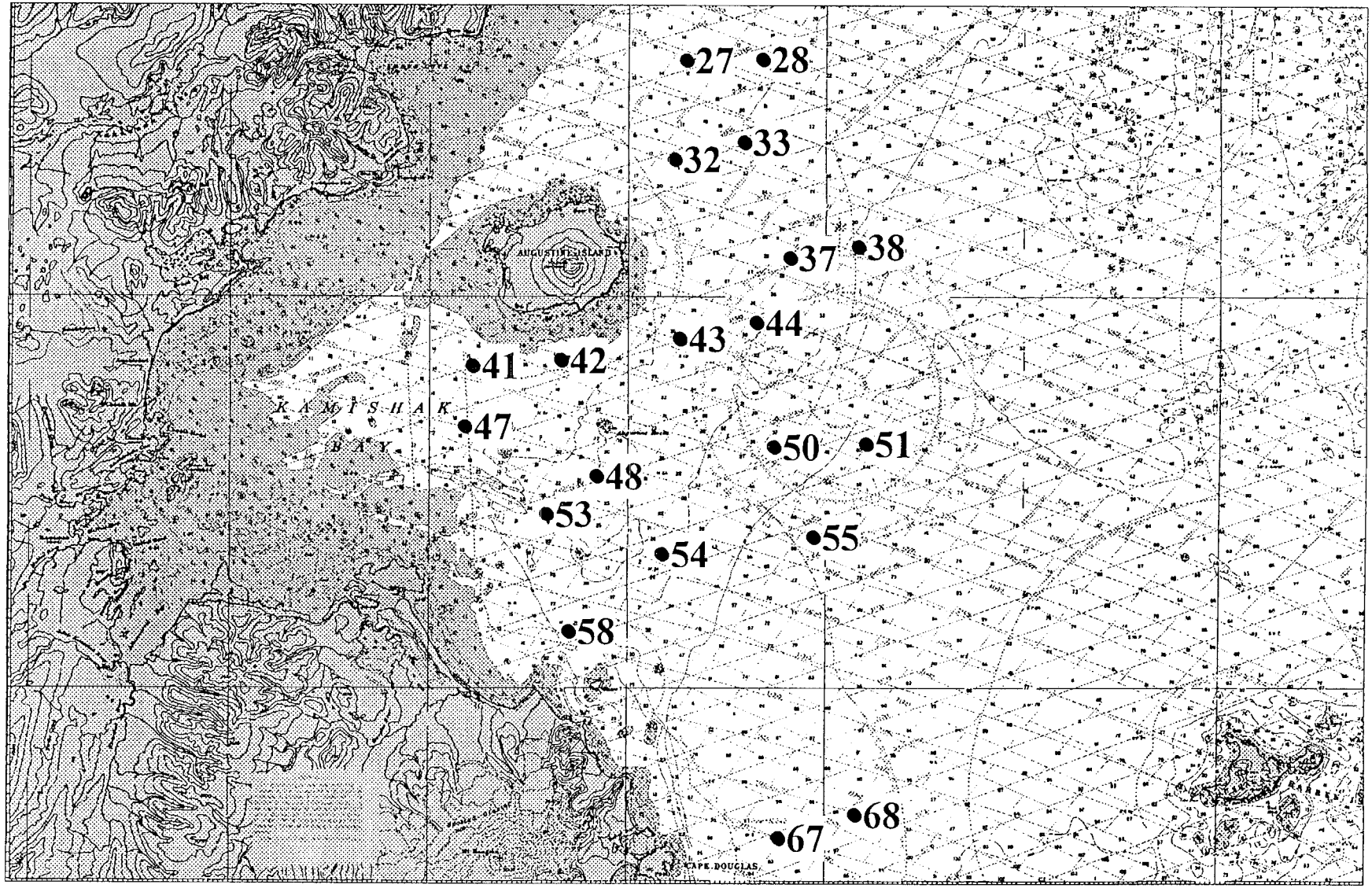

Figure 3. Tow start location for survey stations in a bottom trawl survey of the Kamishak and Barren Islands District, Cook Inlet, during 20-23 June 1996.

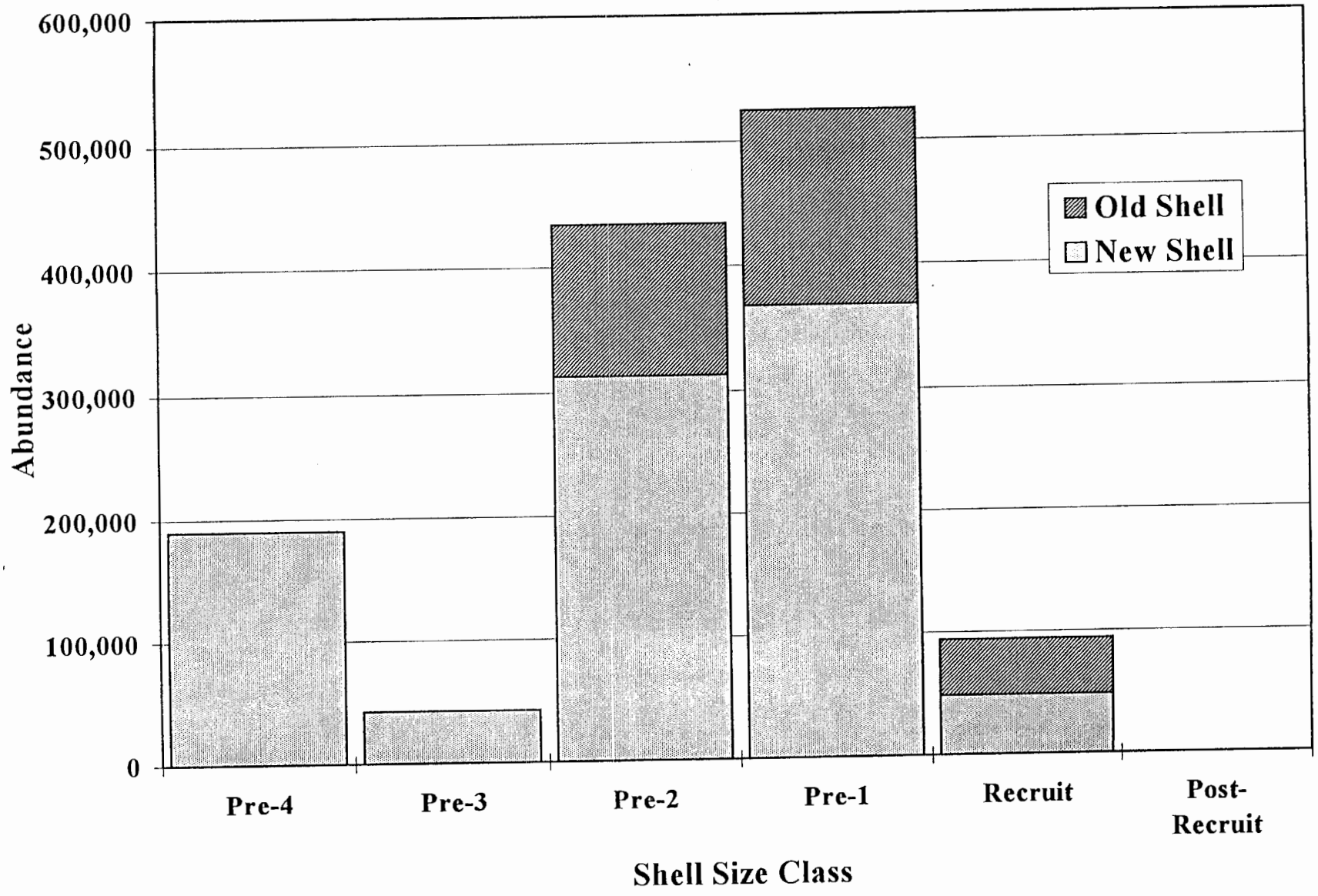

Figure 4. Shell size and maturity composition of male Tanner crab population in the Southern District, Cook Inlet, August 1996.

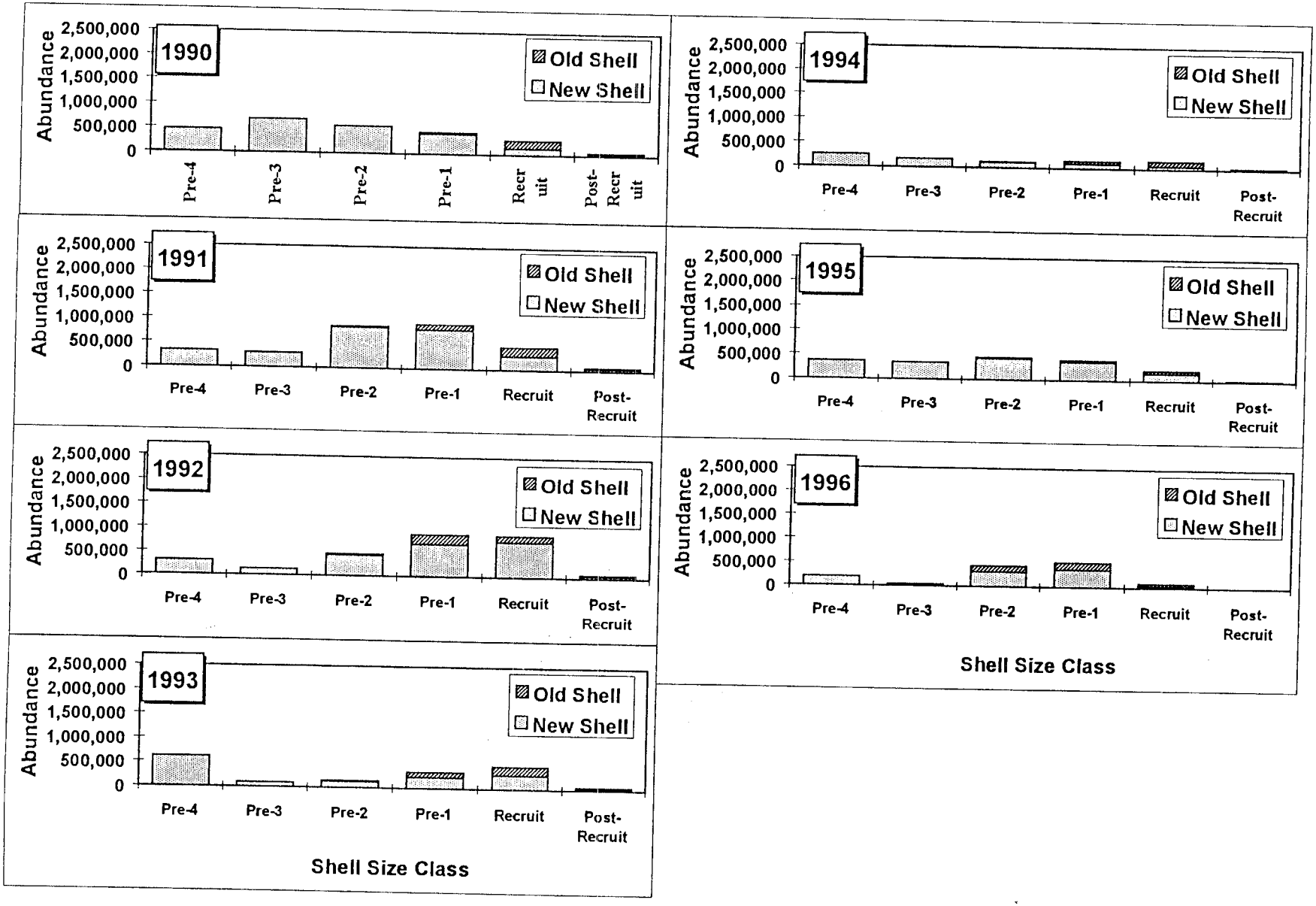

Figure 5. Shell size and maturity composition of male Tanner crab in the Southern District, Cook Inlet, 1990-1996.

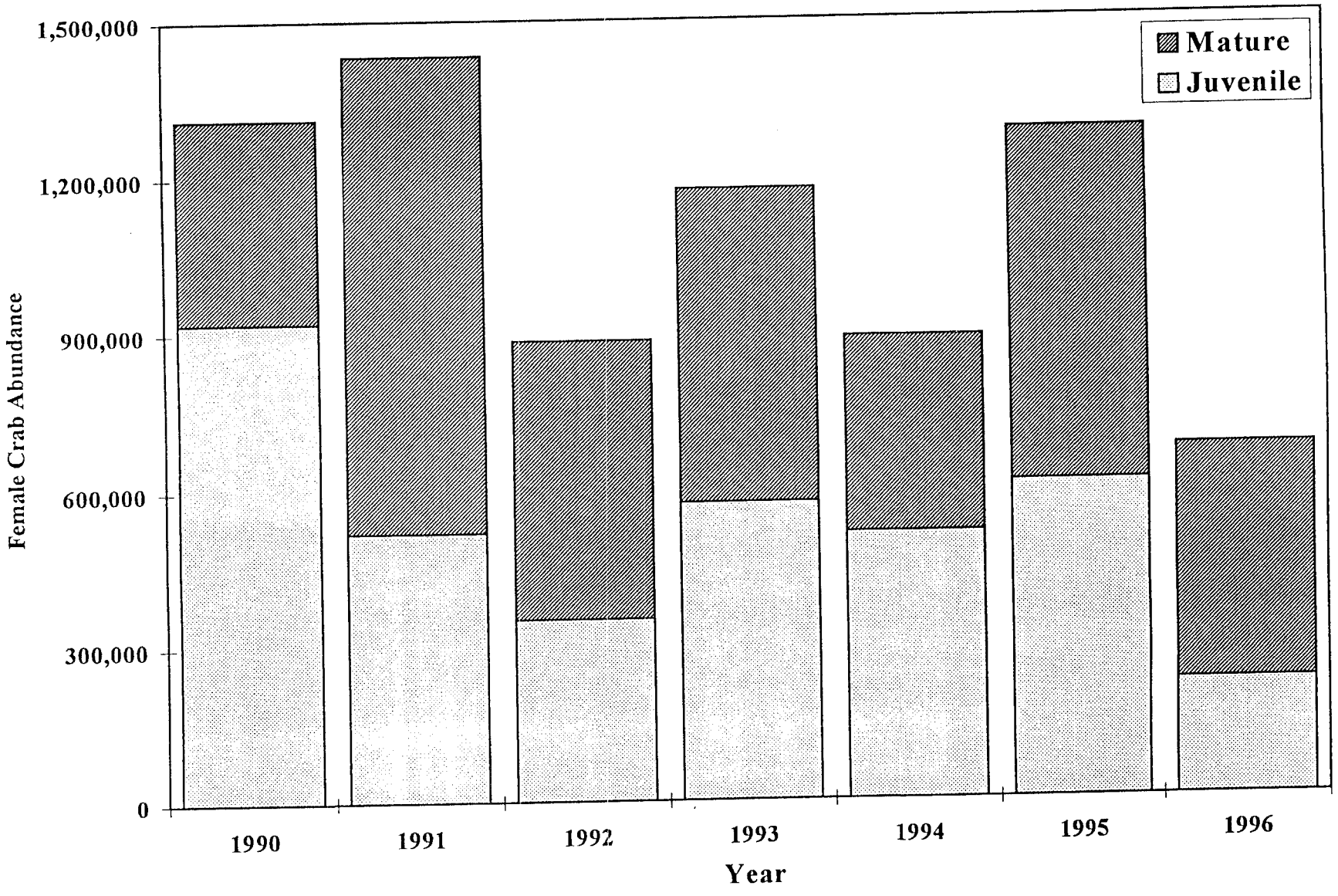

Figure 6. Abundance and maturity of female Tanner crab in the Southern District, Cook Inlet, 1990-1996.

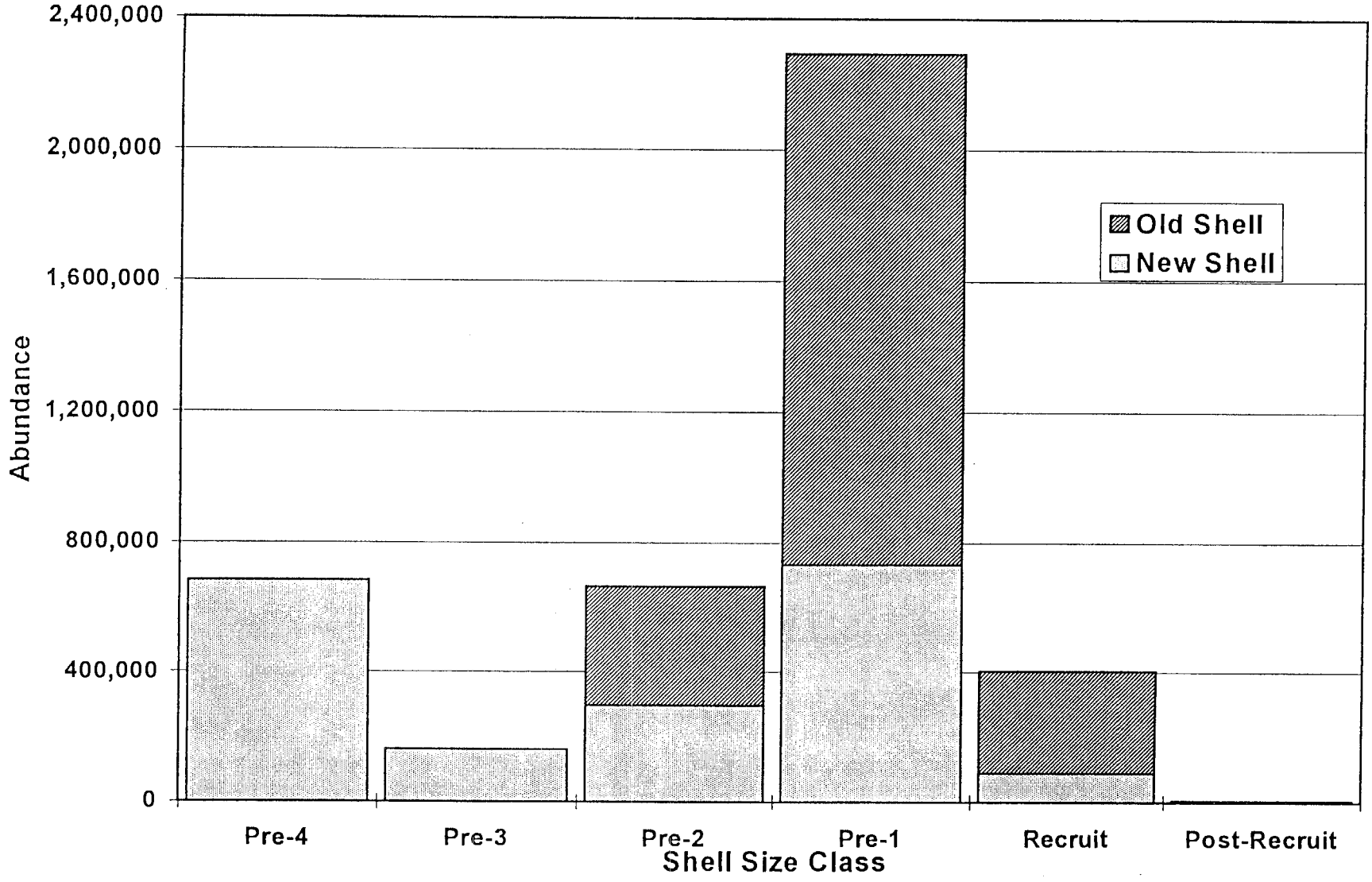

Figure 7. Shell size and maturity composition of male Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, June 1996.

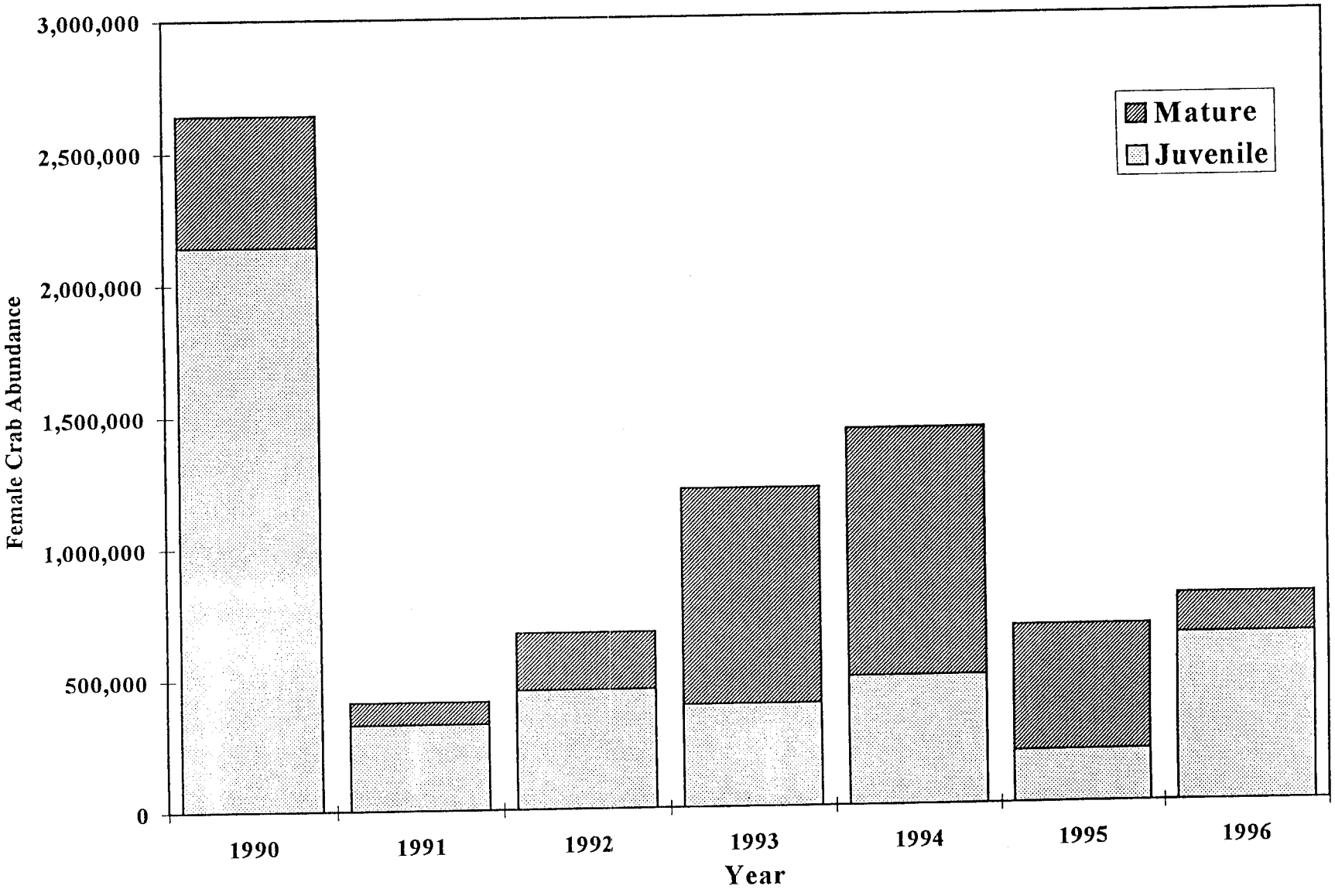

Figure 8. Abundance and maturity of female Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, 1990-1996.

Appendix A. Fishing log and catch (lb) in the Cook Inlet Southern District trawl survey, 17-20 August 1996.

station	Area (nmi^2)	Date	Latitude (start)	Longitude (start)	Course (deg.)	depth (fathom) min.	depth (fathom) max.	duration minutes	distance (nmi)	catch lb
1	4.98	08/17	59°41.82'	151°09.00'	020	30	40	25	1.0	848
2	2.92	08/17	59°40.60'	151°12.17'	020	26	27	23	1.0	250
3	5.52	08/17	59°37.60'	151°15.58'	015	31	35	22	1.0	1,077
4	3.08	08/17	59°37.67'	151°19.37'	030	29	30	24	1.0	1,378
5	5.94	08/17	59°38.23'	151°20.76'	025	14	15	25	1.0	920
6	5.00	08/18	59°36.81'	151°19.95'	035	38	39	32	1.0	2,012
7	3.93	08/20	59°37.43'	151°20.35'	195	33	36	30	1.0	1,896
8	3.57	08/18	59°33.46'	151°29.77'	045	92	92	26	1.0	1,682
9	4.59	08/18	59°33.05'	151°33.63'	035	67	70	30	1.0	1,588
10	8.52	08/19	59°33.48'	151°38.10'	050	46	46	27	1.0	390
11	4.63	08/19	59°31.52'	151°38.92'	060	57	56	30	1.0	1,928
12	6.25	08/19	59°32.78'	151°44.40'	054	36	41	28	1.0	2,614
13	6.25	08/19	59°31.25'	151°13.92'	062	56	59	19	0.6	1,720
14	6.64	08/20	59°34.36'	151°45.26'	215	34	37	26	1.0	6,958
15	3.68	08/20	59°31.24'	151°47.81'	065	43	44	11	0.5	1,326
17	8.94	08/20	59°34.43'	151°49.64'	215	19	20	26	1.0	3,132
18	6.25	08/20	59°31.58'	151°50.50'	210	34	35	29	1.0	1,590
20	6.25	08/20	59°33.94'	151°55.15'	220	18	20	30	1.0	2,585
71	3.42	08/18	59°35.10'	151°23.03'	025	52	75	28	1.0	2,540

Appendix B. Fishing log and aggregate catch (lb) in the Cook Inlet Kamishak District trawl survey, 20-23 June 1996.

station	Area (nmi^2)	Date	Latitude (start)	Longitude (start)	Course (deg.)	Depth (fathom) minimum	Depth (fathom) maximum	Duration minutes	Distance (nmi)	Catch (lb)
27	26.12	06/23	59°31.89'	153°14.19'	292	13	14	27	1.0	880
28	26.12	06/23	59°31.94'	153°06.50'	110	18	19	27	1.0	1,512
32	26.12	06/23	59°26.92'	153°15.34'	100	18	20	28	1.0	760
33	26.12	06/23	59°27.77'	153°08.32'	95	20	22	25	1.0	972
37	26.12	06/23	59°21.89'	153°03.66'	250	26	27	25	1.0	1,390
38	26.12	06/23	59°22.45'	152°56.67'	35	31	33	25	1.0	558
41	16.84	06/22	59°16.47'	153°35.70'	100	17	17	28	1.0	634
42	17.00	06/23	59°16.75'	153°26.75'	90	14	15	13	0.5	0
43	24.75	06/22	59°17.83'	153°14.84'	40	26	27	24	1.0	510
44	26.12	06/22	59°18.63'	153°07.06'	42	29	29	26	1.0	2,034
47	26.12	06/22	59°13.34'	153°36.48'	142	18	19	28	1.0	710
48	26.12	06/22	59°10.81'	153°23.13'	305	20	21	29	1.0	620
50	26.12	06/21	59°12.30'	153°05.27'	30	38	39	28	1.0	2,894
51	26.12	06/21	59°12.47'	152°55.94'	105	60	68	26	1.0	2,822
53	26.12	06/22	59°08.91'	153°28.19'	137	23	23	26	1.0	2,262
54	26.12	06/22	59°06.83'	153°16.58'	10	24	26	25	1.0	596
55	26.12	06/21	59°07.73'	153°01.23'	90	55	63	25	1.0	2,232
58	24.74	06/21	59°02.89'	153°25.93'	305	23	23	27	1.0	1,000
67	26.12	06/20	58°52.27'	153°04.68'	300	90	93	27	1.0	818
68	26.12	06/20	58°53.46'	152°56.91'	226	90	91	28	1.0	832

Appendix C. Data logger temperature recordings from Cook Inlet crab trawl surveys, 1992-1996.

Southern District				Kamishak and Barren Islands Districts			
Date	Station	Temp (°C)	Depth (fm)	Date	Station	Temp (°C)	Depth (fm)
7/15/92	4	7.5	32	7/10/92	61	6.7	82
7/16/92	7	7.5	37	7/11/92	67	6.3	90
7/17/92	10	7.8	47	7/12/92	53	9.3	24
7/18/92	11	7.9	55		Average = 7.4		
	Average = 7.7						
7/6/93	5	6.9	16	6/28/93	53	8.2	22
7/7/93	7	6.7	34	6/29/93	31	10.2	12
7/8/93	8	6.6	67	6/30/93	67	5.5	92
7/12/94	7	7.1	39	7/1/93	54	8.8	23
7/13/94	18	8.4	36	7/2/93	44	8.0	26
7/14/94	15	7.6	41		Average = 8.1		
	Average = 7.2						
6/27/94	3	6.3	30	6/14/94	67	5.9	89
6/28/94	5	6.4	22	6/15/94	38	6.8	29
6/29/94	8	6.0	81	6/16/94	47	7.4	18
6/30/94	11	6.5	54	6/17/94	51	7.1	55
7/5/94	13	6.5	57		Average = 6.8		
7/6/94	18	7.4	35				
	Average = 6.5						
7/5/95	5	6.3	16	6/19/95	34	7.9	27
7/6/95	2	5.7	28	6/20/95	44	7.4	30
7/7/95	10	6.4	49	6/21/95	67	7.1	94
7/8/95	71	6.3	66	6/22/95	47	5.9	19
7/9/95	8	6.0	92	6/23/95	41	7.2	16
7/10/95	15	7.4	39	6/24/95	23	7.1	16
	Average = 6.4				Average = 7.1		
8/19/96	10	9.2	46	6/20/96	68	5.5	91
8/20/96	18	9.7	35	6/21/96	58	7.6	23
	Average = 9.5			6/22/96	41	8.3	17
				6/23/96	37	7.6	27
					Average = 7.3		

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